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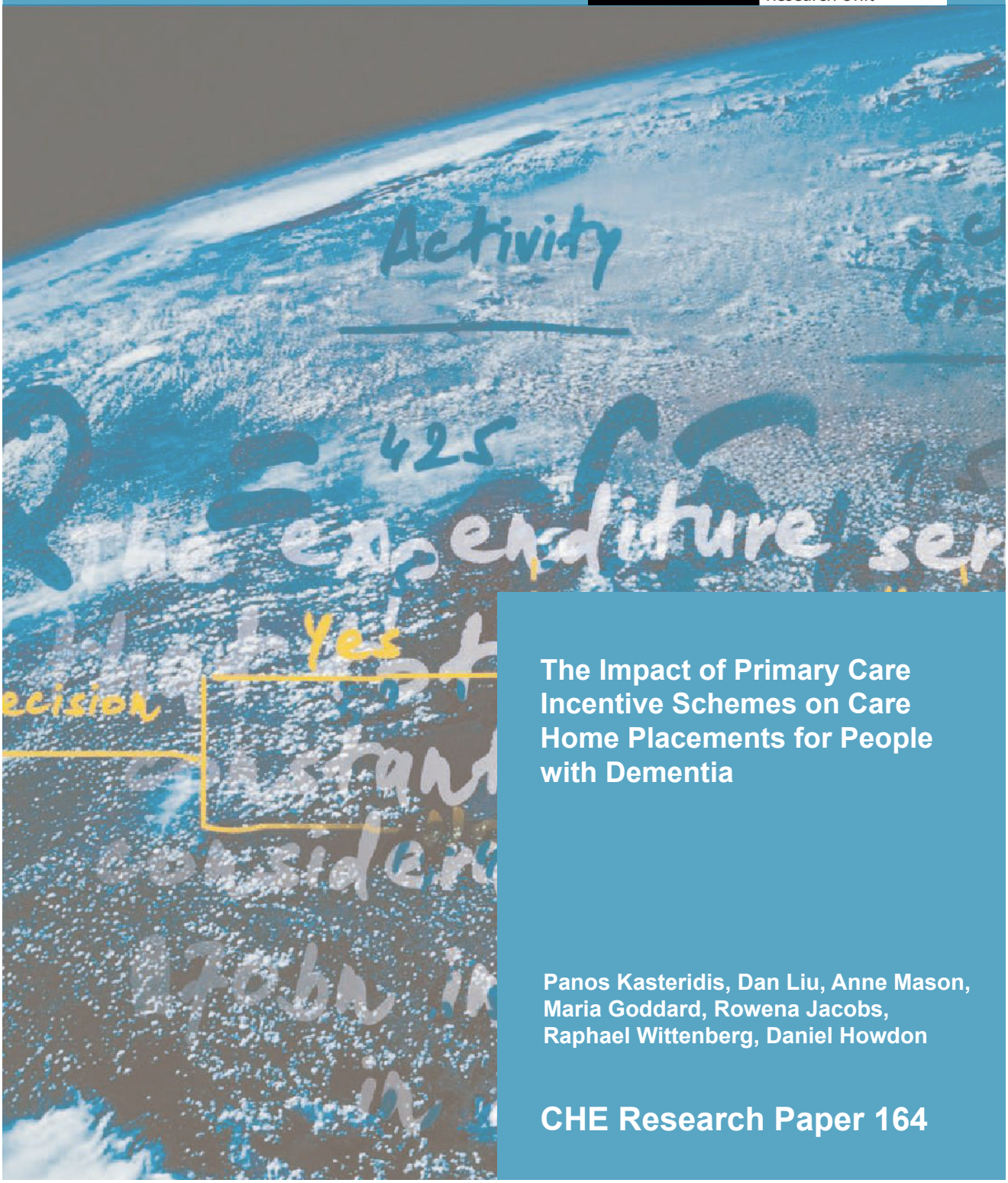

The Impact of Primary Care Incentive Schemes on Care Home Placements for People with Dementia

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Abstract

Objectives: the interface between primary care and long-term care is complex. In the case of dementia, this interface may be influenced by incentives offered to GPs as part of the Quality and Outcomes Framework (QOF) to provide an annual review for patients with dementia. The hypothesis is that the annual reviews reduce the likelihood of admission to a care home by supporting the patient to live independently and by addressing carers' needs for support.

Study period: 2006/07 to 2015/16.

Outcomes: admissions to a care home.

Data: to analyse the impact of annual reviews on care home admissions, we used a linked individual-level dataset covering primary care, secondary care, and mortality from the ResearchOne database (N=30,216). The data provider supplied data on care home events, which they had derived by linking patient postcodes on SystmOne, the clinical system, to the Care Quality Commission's database of care home addresses, then checking the first line of the patient's address for relevant key terms (trigger words).

To help interpret our findings, we identified the types of event occurring at three points in time: the day of the annual dementia review, within a week and within a month of the review. We used the Clinical Practice Research datalink (CPRD) (N=5,169) to investigate these events.

Methods: a survival analysis model was employed to exploit information on the timing of events, in particular whether QOF-incentivised reviews preceded or followed care home admission. We estimated the hazard of the first care home admission as a function of time-varying annual reviews and comorbidities, and time-invariant demographics and local area characteristics.

To identify events around the annual review, we used CRPD to identify visit locations (e.g. face-to-face appointment in the clinic - based on the consultation type code) and broad types of care (e.g. examination - based on Read codes). We measured events on the day of the review, and within the subsequent 7 days and 28 days to capture follow-up activity.

Results: No association was found between annual reviews and an individual's hazard ('likelihood') of care home placement, even after conditioning on time-varying proxies of severity. Higher likelihood of a care home admission was associated with older age at time of diagnosis, female gender, and with having certain long-term conditions, including atrial fibrillation, epilepsy, and stroke. Patients on the palliative care QOF register were also more likely to have a care home placement. Patients living in areas in the lowest quintile of deprivation (most deprived) had a significantly lower likelihood of care home placement than those living in areas in the least deprived quintile. Compared with residents in the East region, patients in London and the West Midlands were significantly less likely to have a care home admission, and those in the North East, North West and Yorkshire and the Humber were significantly more likely to be admitted.

Most reviews took place in the GP surgery (85%) or at home (13%). During the review, GPs examined patients' physical and mental health, ordered tests and made referrals. Carer details were rarely recorded during the review (0.7% of all review events). There was substantial evidence of follow-up activity by the GP practice over the week and month following the review.

Conclusions: Our study found no evidence of an association between the QOF annual dementia review and the likelihood of care home placement. Our analysis utilised a relatively new primary

care dataset containing large numbers of individuals with dementia. The outcome measure was robust, and our model incorporated the timing of annual reviews, events and morbidities. However, this was an analysis of observational, not randomised, data and we were unable to control for some confounding factors. The annual review was assessed using a binary measure, so we could not test whether the quality of the review influenced the risk of care home admission. Therefore, findings should not be interpreted as definitive evidence of the absence of a relationship between the annual dementia review and the likelihood of care home placement.

Introduction

Care home placement is a defining event in the lives of dementia patients and their carers. Whilst a care home placement may be the appropriate decision, care and support for the person with dementia and their carer has potential to delay institutionalisation. In certain circumstances, placement following an acute hospital admission may be indicative of failures in the care process [1]. Understanding how inappropriate or premature placements can be avoided has important implications for patients, carers, commissioners and policymakers.

Dementia is a devastating long-term condition, managed predominantly in the community and requiring integrated health and social care. GPs are uniquely placed to co-ordinate care for people with dementia and their carers. Since 2006, the Quality and Outcomes Framework (QOF) has rewarded GPs for conducting an annual review for their dementia patients [2]. The review has four parts [2, 3]:

1. Examination of the patient's mental and physical health.
2. Assessment of the carer's need for information (if applicable).
3. Appraisal of the impact of caring on the carer (if applicable).
4. Assessment of communication and co-ordination arrangements with secondary care, and as the illness progresses, also with social care and non-statutory sectors.

In April 2015, the financial rewards linked to the review more than doubled and its scope was extended to include a care plan and the offer of a carer health check, with up to 30 minutes recommended for consultations.

In principle, this type of integrated care could reduce the number of people admitted to long-term residential care directly from an acute hospital ward, for example by early treatment of ambulatory care sensitive conditions. Proactive carer support could also postpone admission to long-term care, with the carer better able to manage the patient at home. Conversely, proactive carer support could shorten the time to placement, with the carer recognising that a move to long-term care is in the best interests of both their own health and that of the person with dementia. Therefore, the expected impact of an annual review on the timing of a care home placement is ambiguous.

This paper aims to test empirically whether the QOF dementia review is associated with the hazard ('likelihood') of care home placement in people with dementia.

To address our research question we estimate survival analysis models utilising the ResearchOne dataset. ResearchOne includes de-identified clinical and administrative records that allow patients to be tracked over time. Crucially for our study, the dataset provides information on the timing of events, enabling us to identify whether QOF-incentivised care precedes or follows care home placement.

To investigate a potential mechanism by which the review might influence the decision to enter long-term care, we used a separate dataset (the Clinical Practice Research Datalink (CPRD)) to understand the types of event occurring around the time of the annual dementia review.

Methods

Data

ResearchOne is a not-for-profit database [4] run by TPP. Sourced from GP practices using the clinical system SystmOne, ResearchOne has a higher coverage of the North/North East than of other English regions. We accessed a dataset of individuals with dementia as part of an initiative by the Academic Health Sciences Network (AHSN) for Yorkshire and Humber to promote the ResearchOne Data Service to the region's research community. These de-identified data were funded by the AHSN.

Previous studies of ResearchOne have developed a frailty index for older people [5], examined the environmental effects on diabetes [6], used the data to capture familial history for breast cancer [7], investigated the effects of the meningococcal B (MenB) vaccine [8] and tested the effectiveness of text messages for increasing uptake of influenza vaccination [9].

ResearchOne includes information on primary care diagnoses, referrals, laboratory results, prescriptions, and immunisations. This information is recorded using a hierarchical coding system known as Read codes (version 3, CTV3). Read codes were used to identify dementia patients for the sample, care quality (QOF indicators) and to define morbidity profiles.

To understand events around the dementia review, we used data from the Clinical Practice Research datalink (CPRD) GOLD. We used this dataset instead of ResearchOne because CPRD had more detailed information on tests, therapeutic procedures and referrals. CPRD has been used in over two thousand research papers [10]. It holds anonymised primary care records sourced from participating UK general practices that use the Vision software system. The dataset is representative of the English population with respect to age and gender, but not with respect to region. For example, the north east of England, which has higher levels of disadvantage, is under-sampled, while the coverage in more affluent areas in the west and south of England is relatively high [10]. A subset of CPRD practices based in England permit linkage to secondary care and mortality data sources (CPRD GOLD). The data source for inpatient hospital admissions is the Hospital Episode Statistics (HES). Unlike ResearchOne, CPRD uses version 2 Read codes.

Sample selection for the survival analysis

Our original ResearchOne extract included 73,758 dementia patients. ResearchOne provided the complete registration history of the patient.

Table 1 presents eight types of patient registration profile, according to the duration of their registration (spell). Profile types 1 to 3 had no registration spell that contained the date of diagnosis (index date). Type 1 patients were diagnosed earlier than any registration spell; type 2 were diagnosed later than any registration spell; and type 3 had registration spells before and after (but not on) the date of diagnosis (index date). Since there was no information about the practices at which these patients were registered at the time they were diagnosed with dementia we excluded them from the study.

Patients with profile types 5 to 8 had multiple overlapping registration spells that contained the index date. Since we could not identify which registration spell was valid, we could not assign the patient to a unique practice and we therefore excluded these patients from the analysis.

Table 1. ResearchOne: registration profiles

Profile type	No. registration spells that contain the index date	No. patients	Registration profile	No. patients	Included in the study
1	0	22,000	I…(ERS…ERE)…	21,412	No
2			…(LRS…LRE)…I	127	No
3			(RS1…RE1)…I…(RS2…RE2)	461	No
4	1	49,619	(RS…I…RE)	49,619	Yes
5	>1	2,139	(RS1…I...RE1) &…(RS2…I...RE2)	1,906	No
6			(RS1…I...RE1) &…(RS3…I...RE3)	218	No
7			(RS1…I...RE1) &…(RS4…I...RE4)	14	No
8			(RS1…I...RE1) &…(RS5…I...RE5)	1	No
	Total	**73,758**		**73,758**	

RS: Registration start, RE: Registration end
ERS: Earliest registration start, ERE: Earliest registration end
LRS: Latest registration start, LRE: Latest registration end

There were 49,619 patients with a unique registration spell containing the index date (i.e. profile type 4). Table 2 summarises the steps taken to construct the sample.

Table 2: ResearchOne sample construction

	No. excluded	Sample
Patients with dementia registered at a unique practice at the time of diagnosis (index date)		49,619
Drop patients with missing deprivation / region information	811	48,808
Keep patients diagnosed after 31st March 2006 and before 1st April 2017	11,224	37,584
Drop patients for whom care home events occurred before or on index date*	6,844	30,740
Drop patients with index date later than death date	409	30,331
Restrict to patients older than 50 at index date	93	30,238
Keep if index date earlier than the last seen date**	22	30,216

* index date is the date of the first dementia diagnosis
** last seen date is the earliest of death date, registration end date, and 31 March 2016

Information on deprivation was based on the small area (Middle Layer Super Output Area (MSOA)) linked to the patient's address.[1] A patient can have several addresses (MSOAs) recorded in her address history. For some – but not all – of the records in the Address History file, ResearchOne records the national Index of Multiple Deprivation (IMD) ranking of the corresponding Lower Layer Super Output Area (LSOA). Rankings are from the most deprived to the least deprived. From this ranking, we derived deprivation quantiles using the 2010 IMD, which we expressed in the reverse order i.e. the first quintile was the least deprived and the fifth quintile was the most deprived.

We dropped 811 patients for whom no IMD or region information was available. As a patient may be linked to several MSOAs, and IMD information was missing for many MSOAs, we employed the following strategy to use the most reliable information while retaining the largest number of

[1] The Address History file does not contain patient addresses, but the MSOA code linked to the address.

observations. If the dates associated with a patient's MSOA fell within the period the patient was registered with a practice, we used this MSOA to allocate an IMD ranking. Otherwise, we drew information from another MSOA linked to the patient, even if the MSOA dates were inconsistent with the practice registration dates. A similar strategy was used to define the patient's region.

To exclude people whose unobserved past care or events could influence both their subsequent care and their outcomes, we identified patients who were first diagnosed with dementia after 31 March 2006.

Annual Reviews (ARs) were identified from relevant Read codes, but Read codes are insufficiently reliable for identifying care home residency. Instead, the data provider, TPP, provided us with information on care home events. TPP linked patient postcodes from SystmOne to the Care Quality Commission (CQC) database of care home addresses. This flagged potential care home residency (i.e. the person lived in a location with the same postcode as a care home). Next, TPP checked the first line of the patient's address for relevant key terms (or 'trigger words') using natural language processing. Positive identifications were tagged as 1, and, where possible, were validated against the GP record.

We merged in data on care home residency. We dropped patients who were admitted to a care home before their index (diagnosis) date, because these individuals are not 'at risk' of a care home admission. We also dropped patients whose index date was later than date of death and restricted the sample to patients aged 50 and over on the index date. Lastly, we dropped cases with missing follow-up data.

Sample selection for event around the QOF Review

To understand GP activity around the annual dementia review, we used a CPRD (GOLD) dataset containing over 305,000 records of individuals with long-term conditions. We used Read codes from the QOF business rules to identify patients diagnosed with dementia. After applying various restrictions, our CPRD sample included 5,194 individuals (Table 3).

Table 3. CPRD GOLD dementia sample construction

Patients with a dementia diagnosis in CPRD	12,046
Keep patients diagnosed after 31st March 2006 and before 1st April 2016	7,780
Drop patients for whom care home events occurred before or on index date*	7,379
Keep patients with registration before the index date	5,287
Restrict to patient older than 50 at index date	5,279
Keep if index date earlier than the last seen date**	5,196
Drop if IMD information is not available	5,194

*index date is the date of the first dementia diagnosis

**last seen date is the earliest of death date, registration end date, and 31 March 2016

Survival modelling

A semi-parametric Cox survival analysis model was employed to exploit information on the timing of events, most crucially whether QOF-incentivised reviews preceded or followed care home admission. We estimated the hazard of the first care home admission as a function of time varying registration start dates and comorbidities, and time invariant demographics and local area characteristics.

The hazard function for each outcome can be written as:

$$h_i(t) = \lambda_0(t)\exp\left\{\mathbf{X}_i\boldsymbol{\beta} + \gamma_1 M_{i1}(t) + \ldots + \gamma_k M_{ik}(t) + \delta AR_i(t)\right\} \quad (1)$$

It is the product of the baseline hazard, $\lambda_0(t)$, and an exponentiated linear function of time-invariant covariates $\mathbf{X}_i$, and the time-varying morbidities and ARs.

The baseline hazard can be interpreted as the hazard function for an individual whose covariates take values of 0. The ratio of the hazards for two individuals i and j is:

$$\frac{h_i(t)}{h_j(t)} = \exp\left\{\beta_1(X_{i1} - X_{j1}) + \ldots + \beta_l(X_{il} - X_{jl})\right\} \times \exp\left\{\gamma_1[M_{i1}(t) - M_{j1}(t)] + \ldots + \gamma_k[M_{ik}(t) - M_{jk}(t)] + \delta[AR_i(t) - AR_j(t)]\right\} \quad (2)$$

In the absence of time dependent ARs and morbidities, $\lambda_0(t)$ cancels out and the hazard ratio (HR) is constant over time. In this case, we say that the hazards are proportional and if we graphed the log hazards for any two individuals they would be strictly parallel. However, the proportionality of hazards ceases to hold once we introduce the time varying variables into the Cox regression model. Because the time-varying variables change at different times for different individuals, the ratio of the hazards does not remain constant. Estimation of the Cox model via partial likelihood is still feasible - albeit more complicated and time consuming. A HR greater than 1 indicates an increase in the hazard of the outcome associated with a unit change in the explanatory variable, and vice versa for a HR below 1. Hazard is the **instantaneous** risk of an individual reaching the endpoint in a survival analysis [11], but for simplicity we use the term 'risk' to denote hazard when reporting results.

It is a statistical term and does not imply a 'hazardous' outcome. Nevertheless, to avoid any confusion we loosely interpret a hazard ratio greater than 1 as implying that a care home admission is 'more likely to occur' rather than implying a greater hazard of care home admission. To reflect the strict definition of hazard in statistics, the expression 'more likely to occur' should be read as the **instantaneous** likelihood of occurrence.

Patients varied considerably in the number, frequency and regularity of AR indicators they received. Our design deals with irregularity in the frequency and timing of AR indicators through a binary time-varying variable that takes a value of 1 if the patient has received an AR within the last twelve months. If the patient receives a further AR within the twelve-month window, the period of the AR is extended to reflect receipt of the new AR. The choice of the twelve-month window to determine expiration status is based on the QOF guidance that an AR should be reviewed annually. Time-varying morbidity variables were constructed in a similar way.

Events around the annual dementia review

We restricted the CPRD GOLD dataset to include individuals with an annual QOF dementia review at any time in the study period 2006/07 to 2015/16 (N=3,932). For each patient, we generated a numbered indicator for the date of each review and dropped reviews that occurred after a care home admission. We used the CPRD variable 'constype' from the Consultations file to identify

different types of visit location.[2] This variable was previously used by Kontopantelis and colleagues (2015) to analyse primary care consultation rates for people with severe mental illness [12]. We disaggregated these categories further to distinguish between reviews taking place in the GP surgery, in the patient's home and out-of-hours (OOH). We used the first character of the Read code associated with an event to define broad categories of care, and examined morbidity-related events separately. We used the CPRD browser to identify Read codes associated with caregiving (Appendix 2).

We then counted the frequency of care types and visit types recorded at three timepoints:

1. On the review day.
2. Up to 8 days after the review (i.e. one week after the review).
3. Up to 28 days after the review (i.e. one month after the review).

Periods two and three were selected to capture follow-up care by the GP.

[2] This 'consultation type' variable includes information on care location for events involving patient contact. However, for non-contact events the variable describes the type of activity, e.g. 'administration', or 'results recording'. Details are in Appendix 1. CPRD contains other constype variables (e.g. in the events file) but these have a different construction.

Results

Our ResearchOne analysis sample comprised 30,216 patients from 383 practices. Figure 1 shows the regional variation in ResearchOne patients (see also Table 6). Between 30% and 35% of patients resided in Yorkshire and the Humber.

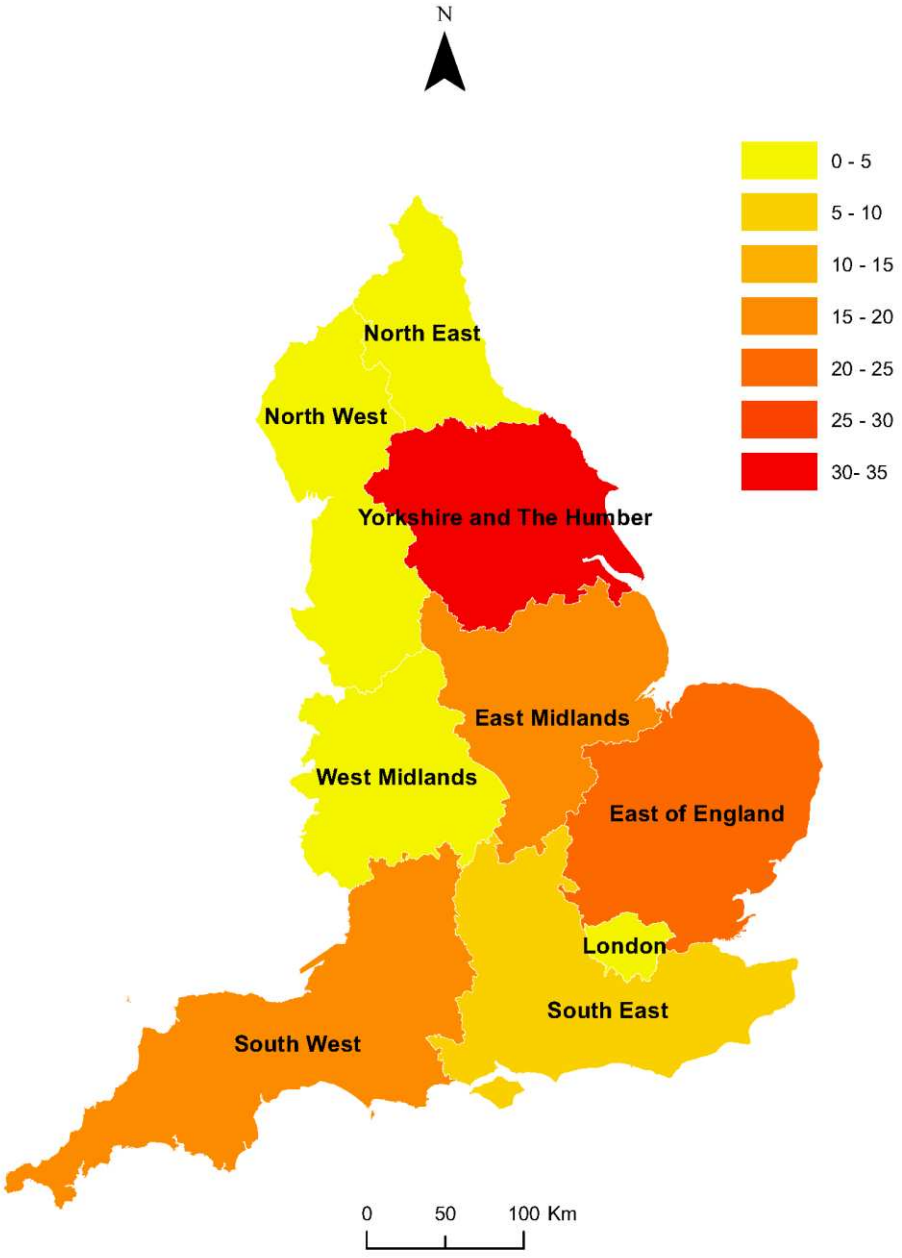

Figure 1: Geographical variation in coverage: % study patients by region

The Tables provide further detail on the dementia patients in ResearchOne. Table 4 shows time-to-event information: 5.17% of patients left the practice and the mean follow-up period for this group was 704 days. Just over 27% of the sample died, on average 714 days from their index (diagnosis)

date. Around one-quarter (24.98%) of patients were admitted to a care home during the study period. Table 5 shows the mean number of annual reviews for these patients. Patients who died had a higher number of reviews on average than those who survived. Table 6 provides descriptive statistics for the variables included in the model. The mean age at diagnosis was 81 years, 41% were male and 65% were recorded as being of white ethnicity (data on ethnicity was missing for almost 25% of patients). In terms of deprivation, patients lived in areas less deprived on average than the English population.

Table 4: Time to event by type of event (ResearchOne)

Type of final event	Frequency of event	%	Average length (days)
Censoring			
Left practice	1,563	5.17	704
Death	8,236	27.26	714
Study terminates	12,868	42.59	886
Care home	7,549	24.98	648
Total	**30,216**	**100**	**771**

Table 5: Annual Reviews (AR) by type of event (ResearchOne)

Type of final event	% of positive ARs	Mean no. ARs	min	max
Censoring				
Left practice	59.31	1.37	0	15
Death	70.52	1.64	0	20
Study terminates	59.87	1.49	0	46
Care home	61.82	1.44	0	32
Total	**63.23**	**1.51**	**0**	**46**

Table 6: Descriptive statistics for the estimation sample (ResearchOne)

	ResearchOne (N=30,216)
Age at first diagnosis	*Mean (s.d.)* 81.52 (7.83)
	%
Male	40.73
Ethnicity	
White	64.86
Non white	10.44
Missing	24.70
IMD	
IMD1	23.50
IMD2	23.66
IMD3	23.16
IMD4	16.40
IMD5	13.28
Region	
East	20.77
East Midlands	17.05
London	1.04
North East	2.49
North West	1.69
South East	8.65
South West	15.33
West Midlands	2.31
Yorkshire Humber	30.55
Morbidities	
Asthma	8.86
Atrial Fibrillation	13.57
Cancer	0.60
Coronary Heart Disease	14.96
Chronic Kidney Disease	23.45
Chronic Obstructive Pulmonary Dis.	16.99
Depression	8.69
Diabetes	18.71
Epilepsy	1.95
Heart Failure	4.04
Hypertension	55.19
Mental health	0.65
Obesity	3.51
Peripheral Arterial Disease	4.40
Palliative care	1.51
Rheumatoid Arthritis	1.94
Stroke	8.76

Note: IMD1: least deprived; IMD5: most deprived.

Regression results – survival analysis

Results from the survival analyses are in Table 7. The QOF annual dementia review had no significant impact on the hazard ('likelihood') of care home placement, even after conditioning on time-varying proxies of severity. Being one year older at first diagnosis of dementia was associated with 6% higher risk of care home placement. Males had 16% lower likelihood of a care home admission. Three long-term comorbidities were associated with a higher likelihood of care home placement: the likelihood was the highest for epilepsy (24%) followed by atrial fibrillation (17.6%) and stroke (9%). Cardiovascular disease, chronic obstructive pulmonary disease (COPD), cancer and mental health problems were not associated with likelihood of care home placement. Patients on the palliative care QOF register were also more likely to have a care home placement, presumably because of their need for end-of-life care.

A non-linear relationship between local deprivation and care home placement was evident. Patients living in areas in the lowest quintile of deprivation (most deprived) were at significantly lower likelihood of care home placement than those living in areas in the least deprived quintile (the reference group), whereas those in areas in the middle quintile were more likely than the reference group to be admitted to a care home.

There were also regional variations. Relative to those residing in the East (the reference category), patients in the North East, North West, and Yorkshire and the Humber were more likely to have a care home placement (87%, 36%, and 29% respectively) while patients in London and the West Midlands were at significantly less likely to be admitted to a care home admission. These regional patterns may reflect differences in bed availability, which is known to vary geographically [13].

Table 7: Results from the survival analyses

	ResearchOne (N=30,216)	
	HR	P-value
Annual Review	0.988	0.651
Morbidities		
Asthma	0.906	0.087
Atrial Fibrillation	1.176***	<0.001
Cancer	0.836	0.261
Coronary Heart Disease	0.998	0.965
Chronic Kidney Disease	0.989	0.697
Chronic Obstructive Pulmonary Dis.	1.046	0.333
Depression	1.048	0.301
Diabetes	0.935	0.053
Epilepsy	1.239**	0.009
Heart Failure	1.007	0.903
Hypertension	0.956	0.088
Mental health	1.015	0.925
Obesity	1.059	0.523
Peripheral Arterial Disease	1.023	0.716
Palliative care	1.236**	0.005
Rheumatoid Arthritis	0.802*	0.010
Stroke	1.092*	0.027
Age at first diagnosis	1.060***	<0.001
Male	0.843***	<0.001
Deprivation		
IMD1 (reference)		
IMD2	1.122	0.062
IMD3	1.151*	0.025
IMD4	0.949	0.450
IMD5	0.668***	<0.001
Region		
East (reference)		
East Midlands	1.019	0.853
London	0.338**	0.009
North East	1.867***	<0.001
North West	1.356**	0.010
South East	0.909	0.402
South West	1.060	0.558
West Midlands	0.615*	0.036
Yorkshire Humber	1.290**	0.005

*p<0.05; **p<0.01, ***p<0.001. Note: IMD1: least deprived; IMD5: most deprived.

Results from events around the QOF review

In total, 3,932 patients (75.7% of the CPRD sample) had at least one annual dementia review during the study period. An overview of the findings, compared against the benchmark of the QOF guidance, is in Table 8.

Table 8: QOF guidance – comparison with events data from CPRD

QOF guidance – annual dementia review		Evidence from CPRD
1	Appropriate physical and mental health review for the patient.	Records of physical and mental health checks, preventative, diagnostic and therapeutic procedures.
2	Carer's needs for information commensurate with the stage of the illness and his or her and the patient's health and social care needs.	Rarely recorded.
3	Impact of caring on the carer.	Rarely recorded.
4	Assessment of communication and co-ordination arrangements with secondary care, and as the illness progresses, also with social care and non-statutory sectors.	Considerable follow-up activity by the practice in the week and month following the review. Some evidence of consultations with secondary care and other providers.

Source: QOF guidance [2, 3]

The CPRD variable for 'consultation type' includes information on care location for events involving patient contact. However, non-contact events are not setting-specific. These constitute the majority of the 'other' category (Table 9) and are mainly administrative.

Table 9: Events around the annual dementia review – consultation type on the review day

Care type	Events	% all events	% visit location (excl. 'other')
Face-to-face: clinic	20,287	45.97	85.00
Face-to-face: home visit	3,185	7.22	13.35
Face-to-face: OOH	25	0.06	0.10
Indirect encounter	366	0.83	1.53
Secondary care visit	3	0.01	0.01
Other	20,268	45.92	
	44,134	**100.00**	**100.00**

Most annual reviews were conducted face-to-face (98.4%), with 85.0% taking place in the GP surgery (Figure 2). GPs also visited patients at home (13.3%), but out-of-hours visits (0.1%) and secondary care settings (0.01%) were uncommon. 'Indirect encounters' (1.5%) usually took the form of a telephone call to (or, sometimes, from) the patient.

The proportions of 'other' settings for follow-up care over week and month after the review were 87.0% and 79.1% respectively, indicative of the level of 'behind the scenes' administration involved. However, telephone consultations (1.0% and 1.5%) and face-to-face follow-up visits (12.0% and 19.4%) also featured during the follow-up periods.

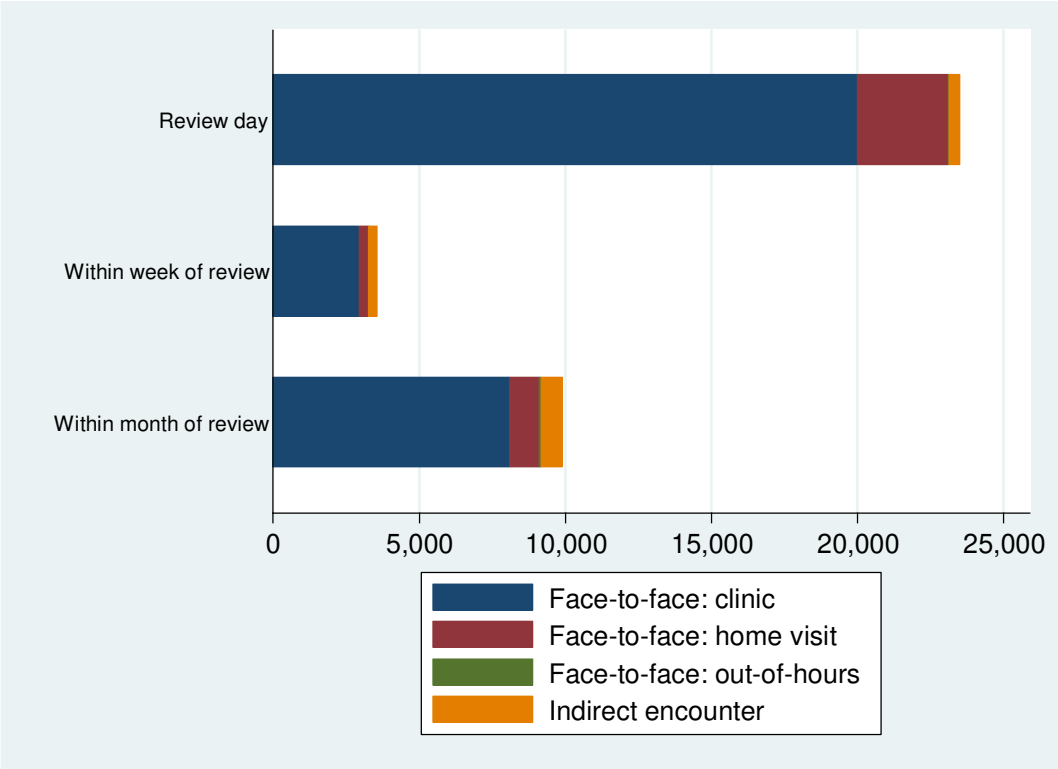

Figure 2: Annual dementia review – visit location

Figure 3 shows the broad types of care provided during and after the annual dementia review. On the review day, GPs were providing the elements of care that might be expected. Laboratory tests were the main category of activity, but GPs also noted signs and symptoms, conducted physical and mental examinations, checked blood pressure and body mass index (BMI), and enquired about smoking and drinking, mobility and social functioning. There was evidence of active follow-up care in the form of further laboratory tests and having 'indirect encounters' with patients, i.e. contacting them by telephone, letter or email. GPs also made referrals, consulted third parties and corresponded with secondary care.

Events on the person's carer were seldom recorded, occurring in approximately 7 in 1000 events on the review day (and in fewer than 1 in 2000 events during the follow-up periods). In the main, records documented that the patient had a carer, carer details, their relationship to the person with dementia, and whether they had been offered a health check (and whether this was declined).

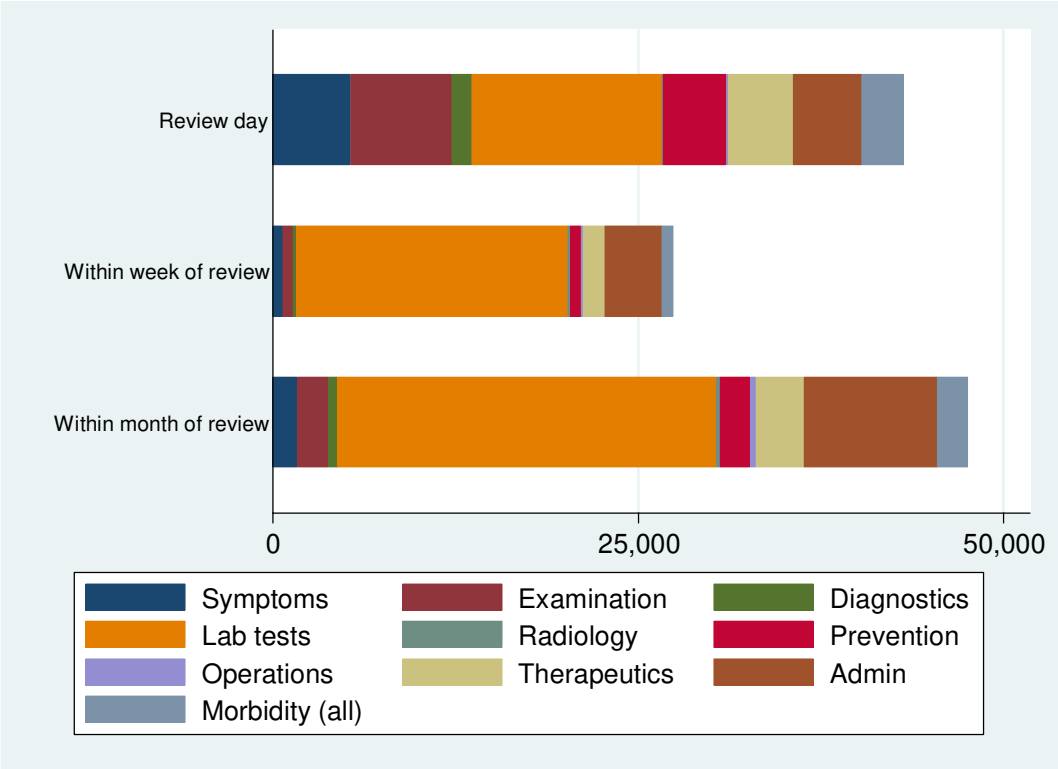

Figure 3: Type of care provided on review day and within following week / month

Events on the annual review day

On average, 5.0 events were recorded on the day of the review. Laboratory procedures (30.5% of all events) were the most frequent type of care, typically involving tests for serum electrolytes, kidney function, cholesterol, protein and thyroid. Physical examinations (15.9%) included blood pressure measurement, checks of weight and height, pulse and foot examinations. There was evidence of preventative care, with patients asked about their history and symptoms (12.3%), including lifestyle factors – smoking, drinking, diet and exercise – and social functioning. Administrative tasks (10.9%) included recording the site of the encounter, but also – very occasionally – carer details (0.7%), the provision of advice, and even 'chats' (0.3%; Read code: 8CB..). Drug therapy, medicines management and care plans featured high on the list of therapeutic procedures (10.0%) documented during the annual dementia review.

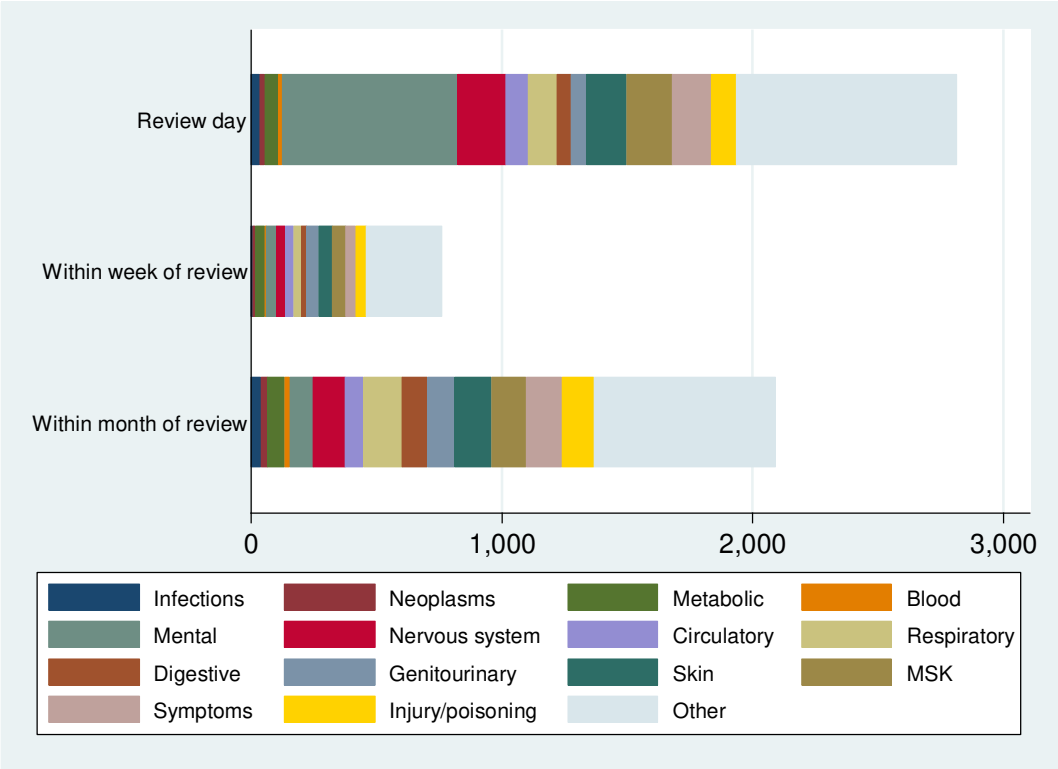

Figure 4: Morbidities recorded on review day and within next week / month

Findings demonstrate that the reviews covered a broad range of mental and physical care; that data on carers is occasionally recorded; and that the review is also, at least sometimes, a social interaction. Specific morbidities were coded in around 6.5% of events (Figure 3), and Figure 4 provides more detail. On the day of the review, the largest single morbidity addressed was 'mental disorders' (24.9% of all morbidity-related events). Diseases of the nervous system (6.8%), musculoskeletal (MSK) conditions (6.5%), skin disorders (5.7%), respiratory conditions (4.1%), signs and symptoms (5.5%) and injuries/poisonings (2.3%) also featured. However, the 'other category' – comprising largely of 'unspecified conditions' constituted almost one-third of morbidity-related events (31.2%).

Events within 7 days of the annual review

Events over the week following the annual dementia review (excluding the day itself) were recorded for two-thirds of patients (67.8%), with 3.1 events per review on average.

Figure 3 shows the types of care providing in the follow-up week. Two-thirds of events (67.9%) were laboratory procedures, with administration the next highest category (14.3%) – around a third of these were indirect encouters with the patient (e.g. telephone calls). Therapeutic procedures (5.4%) and preventative procedures (2.8%) were relatively uncommon. There was evidence of considerable 'follow-up' activity by the practice, including further face-to-face visits (Figure 2) .

Figure 4 provides more detail of the 'morbidity' category. Far fewer morbidity-related events were recorded compared with the review day (758 events compared with 2814 on the review day; 2.8% of events compared with 6.5% on the review day), with almost 40% of these being non-specific ('other' category). Given almost one-quarter of morbidity events on the review day were for mental-health disorders, activity within the following week was surprisingly uncommon (5.1%) and similar to activity for physical conditions.

Events within 28 days of the annual review

We also looked at an extended period of follow-up. Over the 4 weeks following the review, there was evidence of follow-up activity for more than 90% of patients, averaging 8.4 events per review. Three-quarters involved laboratory procedures (59.4%) and administration (17.4%), though therapeutic (6.4%) and preventative procedures (3.8%) as well as physical examinations (3.8%) suggested that patients were seen again in person (Figure 2 and Figure 3). Of course, not all these events were necessarily directly related to the reviews.

Within one month of the review, over 2,000 morbidity-related events had been recorded with over one-third (34.5%) unspecified (Figure 4). The top three conditions by frequency were respiratory conditions, skin disorders and signs/symptoms – each comprised around 7%.

Discussion

Our study found no association between annual reviews and an individual's likelihood of care home placement, even after conditioning on time-varying proxies of severity. Higher likelihood of a care home admission was associated with older age at time of diagnosis, female gender, and with having certain long-term conditions, including atrial fibrillation, epilepsy, and stroke. Patients on the palliative care QOF register were more likely to have a care home placement, presumably because of their need for end-of-life care. Patients living in areas in the most deprived quintile were significantly less likely to have care home placement than those living in areas in the least deprived quintile. There were also regional variations: compared with residents in the East region, those in London and the West Midlands were significantly less likely to have a care home placement, and those in the North East, North West and Yorkshire and the Humber were significantly more likely to have a placement.

Most reviews (85%) took place in the GP surgery, although patients were sometimes reviewed at home (13%) or indirectly (e.g. by phone, 1.5%). During the review, GPs examined patients' physical and mental health, provided preventative and therapeutic interventions, ordered tests, made referrals and consulted third parties. There was substantial evidence of follow-up activity by the GP practice over the week and month following the review. These activities are indicative of care co-ordination.

However, carer details were rarely recorded during the review (0.7% of all review events). Our study period covers one year after the introduction of a financial incentive to GPs to offer health checks to carers of people with dementia (April 2015), but the low level of recording of carer details is puzzling nonetheless. Asking the carer about their support needs has been a core element of the annual dementia review since its inception in April 2006 [2], but only a handful of relevant codes were recorded (e.g. 13VN., carer able to cope; 8O7..; carer support; 388Q., carer strain index) – so few, that numbers are too small to report.

Strengths

The study had a number of strengths. The analysis utilised a relatively new primary care dataset containing large numbers of individuals with dementia. Our outcome measure, care home admission, was robust. TPP, the data provider, had developed a novel method of identifying care home admissions. TPP provided this variable, enabling us to identify far more cases than would be possible from Read codes alone. We introduced time-varying comorbidities, to try to capture deteriorations in health status, and employed a survival analysis that enabled us to take account of the sequence of events.

We also identified events around the review; as far as we are aware, this has not been done previously. Compared against the benchmark of recommended types of care for the QOF annual dementia review, results appeared encouraging – at least, in terms of activity for the person with dementia. Support and information for carers are two key recommended elements of the QOF review but we found little evidence that GPs were providing these. We cannot however be sure that these events did not take place on an informal basis, but were not recorded.

Limitations

This analysis was based on observational data rather than data from a randomised study. Although we included a range of control variables in our analyses, we cannot exclude the possibility of omitted variable bias and have been cautious in drawing causal inferences. We could not distinguish different types of care home admission (planned or unplanned), or to control for some important

confounding factors such as the level of frailty or functioning of the care recipient, whether they lived alone, or their receipt of informal care or of domiciliary care.

Our analysis tested a binary measure of whether the patient received a review or not. Given the types of care provided during the review, it is plausible that patients who received a higher quality review may have been less likely to have an unplanned care home admission than those who received poorer quality care. Our intention was to examine whether the quality of care provided in the review was associated with the likelihood of care home placement, but the datasets did not allow us to explore this issue. Details of the events around the review could only be explored in CPRD, whereas the analysis of care home placement used ResearchOne as this had a robust outcome measure. Our previous work [14] identified a lower likelihood of an unplanned placement to a care home following acute hospitalisation, though this national analysis lacked detailed primary care data on receipt of an annual review.

There were two concerns about CPRD that meant the dataset was unsuitable for the analysis of care home placement. First, the prevalence of care home admissions was implausibly low, and second, over 50% of patients left CPRD practices (compared with 5% in ResearchOne). This patient group may be more likely to move practice than those without dementia (e.g. on entry to a care home). Whereas ResearchOne tracks patients across practices, CPRD does not. Therefore, in CPRD these individuals are effectively lost-to-follow-up and their hazard of a care home placement is indeterminate.

Implications for policy and further research

We identified a number of predictors of care home placement, though few that are amenable to policy interventions as they were associated with the demographic and health characteristics of individuals. We found those living in areas with the highest level of disadvantage were less likely to be admitted to a care home, suggesting inequalities in access. A possible explanation is the relatively high fees charged by care homes and the difficulties securing local authority support [15]. An alternative explanation is that individuals living in more deprived communities were more likely to die from other conditions before their dementia became severe enough to warrant a care home placement.

In a systematic review of the QOF, Forbes et al (2017) note that indicators for some conditions, including dementia, have potential to incentivise integrated care through reviews and care plans [16]. Our examination of events around the review suggest there are grounds for cautious optimism. Future analyses of more detailed ResearchOne datasets could explore a range of outcomes associated with measures of integrated care.

The low level of recording of carer details raises the possibility that GPs may have been less proactive in offering carer support than the QOF recommends. An incentive to provide carer health checks was introduced in April 2015, and future research could examine its effects on the recording of carer details.

Conclusion

We found no evidence that the QOF annual dementia review is associated with a reduced likelihood of care home placement. However, our analysis could not control for some important confounding factors. These limitations mean that our study findings should not be interpreted as definitive evidence of the absence of a relationship between the QOF review and likelihood of care home placement.

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Appendix 1: Defining consultation types

CPRD Code	CPRD Consultation Type	Kontopantelis 2015 [12]	Typology used by our study					
			F2F - clinic	F2F - home	F2F - OOH	Indirect (email / phone)	Secondary care	Other (not setting specific)
0	Data Not Entered							1
1	Clinic	F2F	1					
2	Night visit, Deputising service	F2F			1			
3	Follow-up/routine visit	F2F	1					
4	Night visit, Local rota	F2F			1			
5	Mail from patient	Other - mail				1		
6	Night visit , practice	F2F			1			
7	Out of hours, Practice	F2F			1			
8	Out of hours, Non Practice	F2F			1			
9	Surgery consultation	F2F	1					
10	Telephone call from a patient	Telephone				1		
11	Acute visit	F2F	1					
12	Discharge details	Other - referral / 3rd party consul						1
13	Letter from Outpatients	Other - referral / 3rd party consul						1
14	Repeat Issue	Other - unknown						1
15	Other	Other - unknown						1
16	Results recording	Other - unknown						1
17	Mail to patient	Other - mail				1		
18	Emergency Consultation	Other - unknown						1
19	Administration	Other - Admin						1
20	Casualty Attendance	Other - secondary care episode					1	
21	Telephone call to a patient	Telephone				1		
22	Third Party Consultation	Other - referral / 3rd party consul						1

CPRD Code	CPRD Consultation Type	Kontopantelis 2015 [12]	Typology used by our study					
			F2F - clinic	F2F - home	F2F - OOH	Indirect (email / phone)	Secondary care	Other (not setting specific)
23	Hospital Admission	Other - secondary care episode					1	
24	Children's Home Visit	F2F		1				
25	Day Case Report	Other - referral / 3rd party consul						1
26	GOS18 Report	Other - referral / 3rd party consul						1
27	Home Visit	F2F		1				
28	Hotel Visit	F2F		1				
29	NHS Direct Report	Other - referral / 3rd party consul						1
30	Nursing Home Visit	F2F		1				
31	Residential Home Visit	F2F		1				
32	Twilight Visit	F2F			1			
33	Triage	Other - unknown						1
34	Walk-in Centre	F2F	1					
35	Co-op Telephone advice	Telephone				1		
36	Co-op Surgery Consultation	F2F	1					
37	Co-op Home Visit	F2F		1				
38	Minor Injury Service	Other - secondary care episode					1	
39	Medicine Management	Other - unknown						1
40	Community Clinic	F2F	1					
41	Community Nursing Note	Other - referral / 3rd party consul						1
42	Community Nursing Report	Other - referral / 3rd party consul						1
43	Data Transferred from other system	Other - Admin						1
44	Health Authority Entry	Other - Admin						1
45	Health Visitor Note	Other - referral / 3rd party consul						1
46	Health Visitor Report	Other - referral / 3rd party consul						1

CPRD Code	CPRD Consultation Type	Kontopantelis 2015 [12]	Typology used by our study					
			F2F - clinic	F2F - home	F2F - OOH	Indirect (email / phone)	Secondary care	Other (not setting specific)
47	Hospital Inpatient Report	Other - referral / 3rd party consul						1
48	Initial Post Discharge Review	Other - unknown						1
49	Laboratory Request	Other - referral / 3rd party consul						1
50	Night Visit	F2F			1			
51	Radiology Request	Other - referral / 3rd party consul						1
52	Radiology Result	Other - referral / 3rd party consul						1
53	Referral Letter	Other - referral / 3rd party consul						1
54	Social Services Report	Other - referral / 3rd party consul						1
55	Telephone Consultation	Telephone				1		
56	Template Entry	Other - Admin						1
57	GP to GP communication transaction	Other - referral / 3rd party consul						1
58	Non-consultation medication data	Other - unknown						1
59	Non-consultation data	Other - unknown						1
60	ePharmacy message	NS						1

Appendix 2: Carer Read codes

readcode	readterm
918m.00	Carer of a person with a terminal illness
13CB000	Carer uses public transport
918t.00	Carer from Black and minority ethnic group
918Y.00	Carer of a person with sensory impairment
8IHE.00	Carer health check declined
918b.00	Carer of a person with alcohol misuse
8O7..00	Carer support
8IEP.00	Carer annual health check declined
8BAr.00	Carer health check completed
13Wb.00	Carer has sole parental responsibility
9NSS.00	Carer health check offered
ZW71100	Carer can no longer cope
ZW61100	Carer is unwilling to care
ZW62200	Carer not readily available
918J.00	Carer - home telephone number
9Ngw.00	Carer does not understand care plan
918W.00	Carer of a person with learning disability
ZW68200	Carer uses public transport
918A.00	Carer
9RR..00	Carer to be contacted to make appointment
ZW62100	Carer readily available
918y.00	Carer of person with dementia
Z9MQ.00	Carer support
9Ngv.00	Carer understands care plan
66W3000	Carer aware of prognosis
918X.00	Carer of a person with physical disability
13VN.00	Carer able to cope
69DC.00	Carer annual health check
ZW68100	Carer has own transport
918M.00	Carer - email address
133i.00	Carer concern about patient
ZW63400	Carer lives at a distance
ZW63300	Carer lives nearby
ZW61400	Carer is committed to care
9365	Carer holds patient care plan
9180	Carer's details
918a.00	Carer of a person with substance misuse
918d.00	Carer of a person with mental health problem
13C9000	Carer has own transport
69DE.00	Carer health check
9c0Q.00	Carer perception of problem
ZW61500	Carer willing to share care with professionals
ZW68.00	Carer's transport

918L.00	Carer - mobile telephone number
9NzF.00	Carer present at encounter
ZW61200	Carer is reluctant to care
66W4000	Carer unaware of prognosis
8C95.00	Carer reassured
ZW61300	Carer is willing to care
918K.00	Carer - work telephone number
9q1..00	Carer declined consent for carer details in clinical record
388Q.00	Carer strain index score
9d46.00	Carer
918c.00	Carer of a person with chronic disease